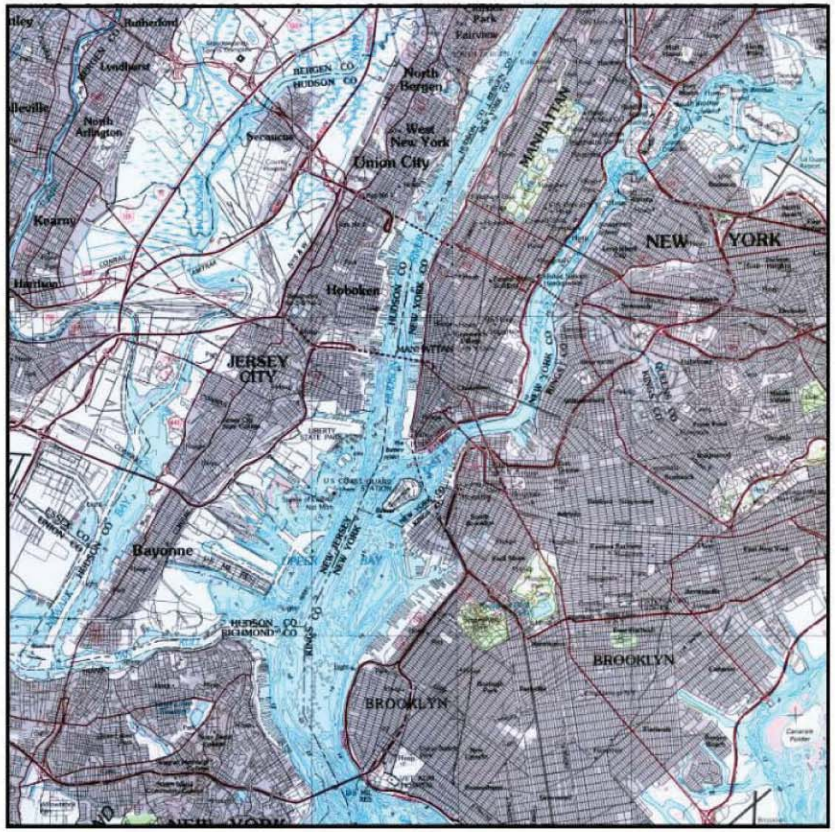
United States Environmental Protection Agency
Office of Research and Development
National Exposure Research Laboratory
Environmental Sciences Division
Landscape Ecology Branch

Mapping The Spatial Extent Of Ground Dust/Debris From The Collapse Of The World Trade Center Buildings

New York, New York

Appendix A, Figures
July, 2004



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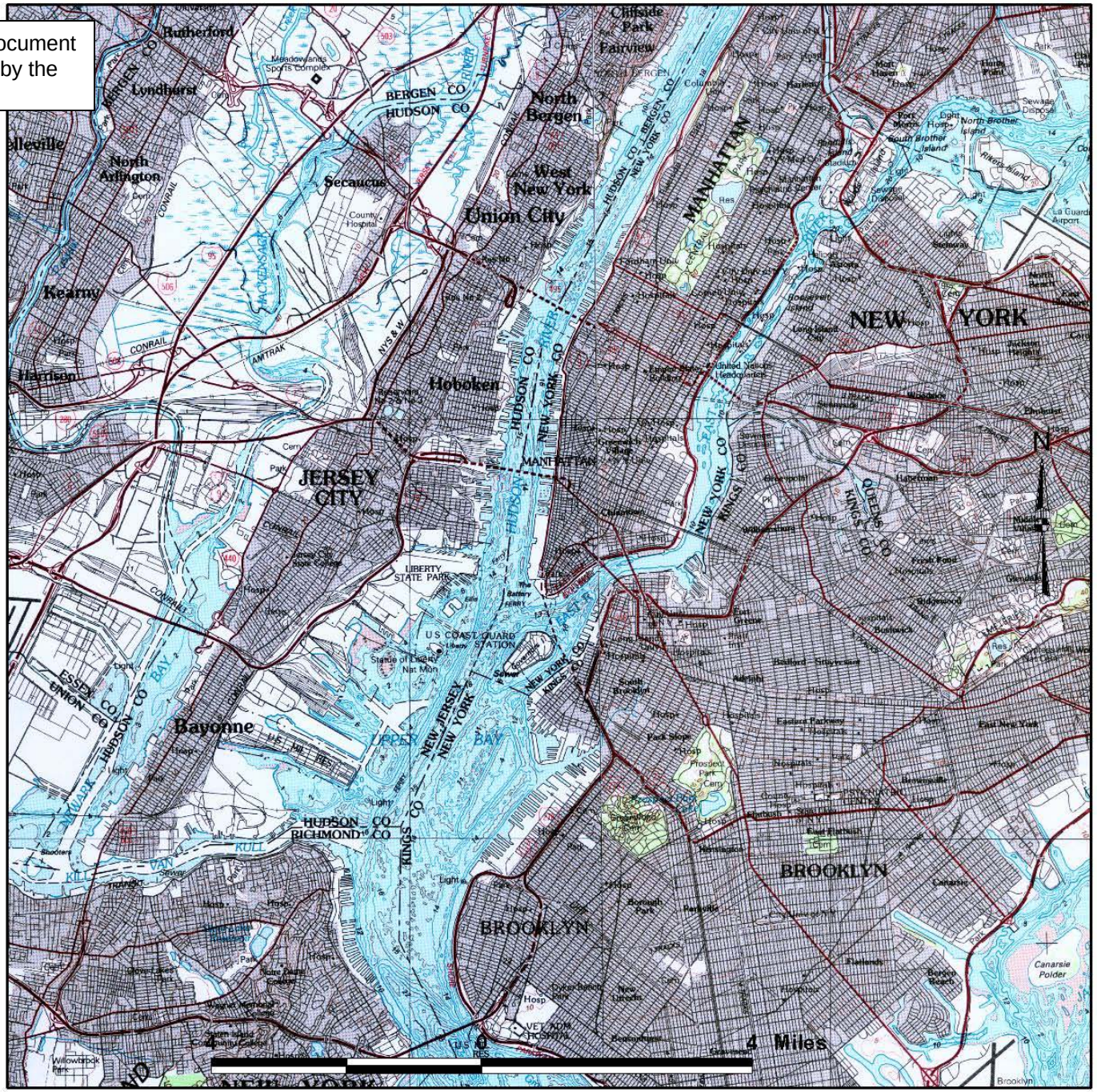

Figure 1. Study area location. Source: USGS topographic 1:100,000 quadrangles, Long Island West (1986) and Newark (1984).

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Figure 2A. September 11, 2001. Source: NYPD image 4. Time is approximately between 10:00 am - 10:30 am. A view of lower Manhattan looking south along West Street. The collapse cloud from WTC building 2 is evident while building 1 and building 7 remain standing. A visible demarcation of dust/debris is present at the intersection of West and Warren Streets.

Figure 2B. September 11, 2001. Source: NYPD image 17. Time is approximately between 10:00 am - 10:30 am. A view of lower Manhattan looking south along West Street towards "Ground Zero". The northern extent of the collapse cloud from WTC building 2 has begun to recede. WTC Buildings1 and 7 remain standing.

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Figure 2C. September 11, 2001. Time is approximately 10:30 am. Source: NYPD image 32. The WTC building 1 collapse cloud is evident funneling north along West Street and West Broadway. WTC building 7 remains standing. The ground dust/debris boundary produced by WTC building 2 remains visible.

Figure 2D. September 11, 2001. Source: NYPD image 35. Time is approximately 10:30am. The WTC building 1 collapse cloud, funneling north along West Street, has enveloped the ground dust/debris boundary produced by the collapse of WTC building 2.

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Figure 2E. September 11, 2001. Source: NYPD image 54. Time is between 10:30am and 5:30 pm. The northern extent of the WTC building 1 collapse cloud has begun to recede. WTC building 7 is visible. The visible ground dust/debris boundary, along West Street, is now located at the intersection of West and Chambers Streets.

Figure 3. September 11, 2001. Source: pp. 48-49 in Above Hallowed Ground. Time of photograph is between 10:30am and 5:30 pm (WTC building 7 is visible). The boundary in orange is the visible ground dust/debris boundary and represents the area of primary deposition, in lower manhattan, due to the collapse of WTC buildings 1 and 2.

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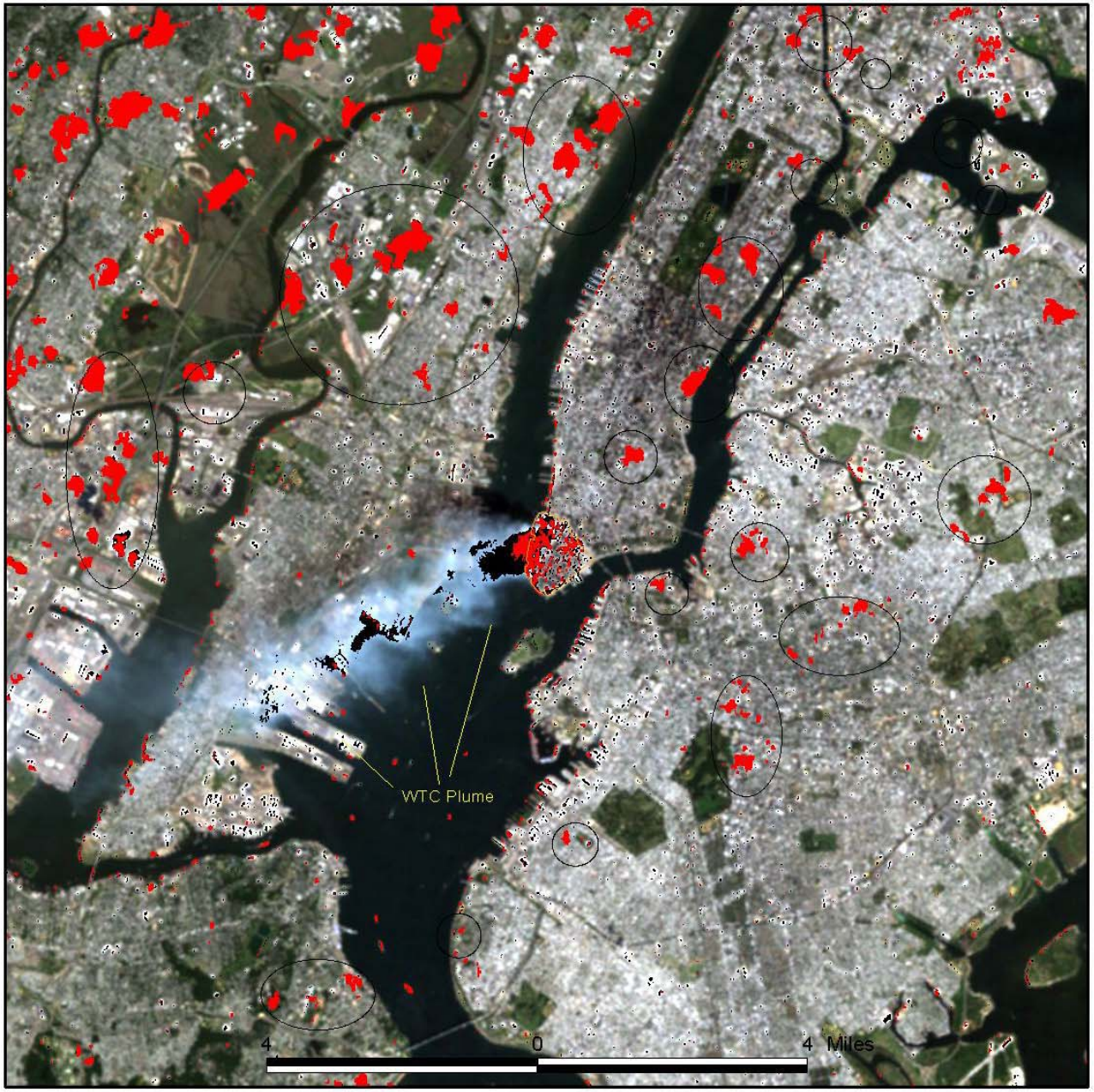
Figure 4. August 27, 2001. Landsat 7 image displayed in natural color, bands 3, 2, 1. This image was used with the September 12, 2001 Landsat 7 image for reflectance change analysis.



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Positive ratio reflectance change, 8/27/01 - 9/12/01

Band 7 Ratio Data
1.65 - 10.00 (> 2 SD)

Band 8 Ratio Data
1.25- 10.00 (> 2 SD)

Ground dust/debris mapped from 9/11/01 photographs

Clouds and Shadow on 8/27/01 image

SD = Standard Deviation

N

Figure 5. September 12, 2001. Landsat 7 image displayed in bands 3, 2 and 1. Image ratio change detection is presented on two overlay attachments and is based on per pixel reflectance change between between 8/27/01 and 9/12/01. Pixels mapped in red (B) represent band 7 data residing beyond 2 standard deviations and pixels mapped in black (A) represent band 8 data residing beyond 2 standard deviations.

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Figure 6. September 12, 2001. Enlarged Landsat 7 image displayed in bands 3, 2 and 1. Image ratio change detection is presented on two overlay attachments and is based on per pixel reflectance change between between 8/27/01 and 9/12/01. Pixels mapped in red (B) represent band 7 data residing beyond 2 standard deviations and pixels mapped in black (A) represent band 8 data residing beyond 2 standard deviations.

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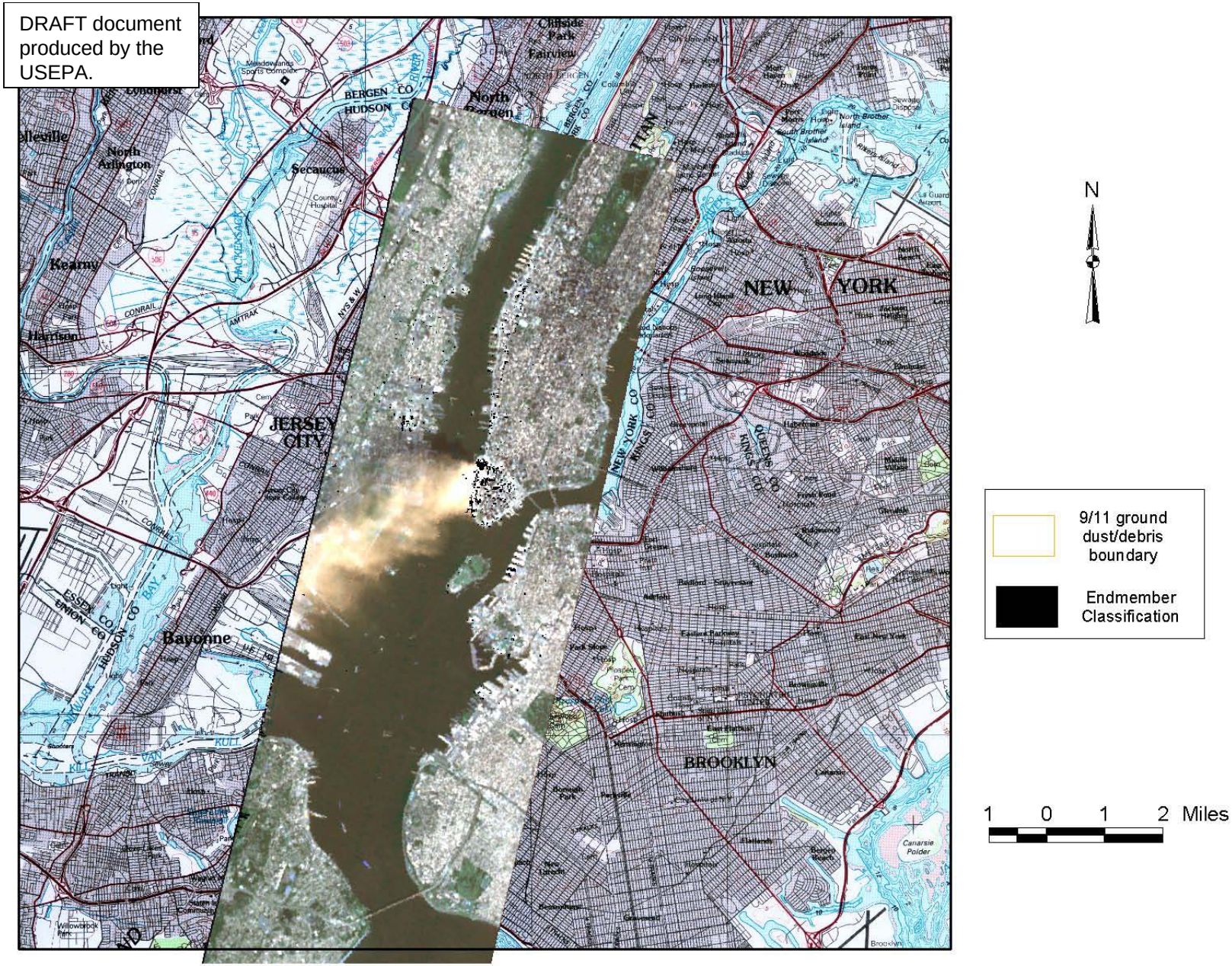

Figure 7. September 12, 2001. EO-1 Hyperion coverage of study area displayed in natural color bands. Endmember Classification is mapped in black on the overlay, and is based on ground spectra of lower Manhattan.

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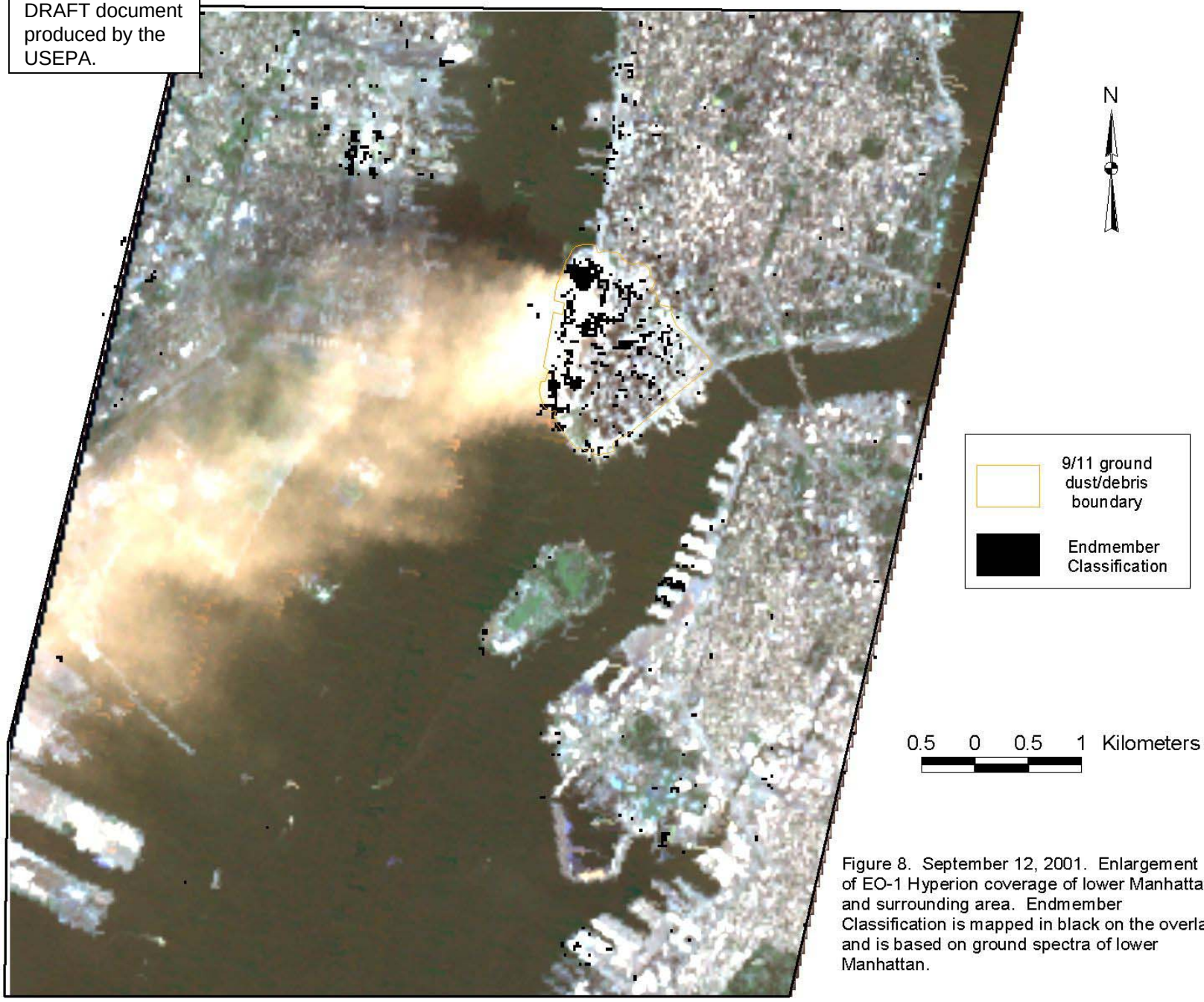

Figure 8. September 12, 2001. Enlargement of EO-1 Hyperion coverage of lower Manhattan and surrounding area. Endmember Classification is mapped in black on the overlay, and is based on ground spectra of lower Manhattan.

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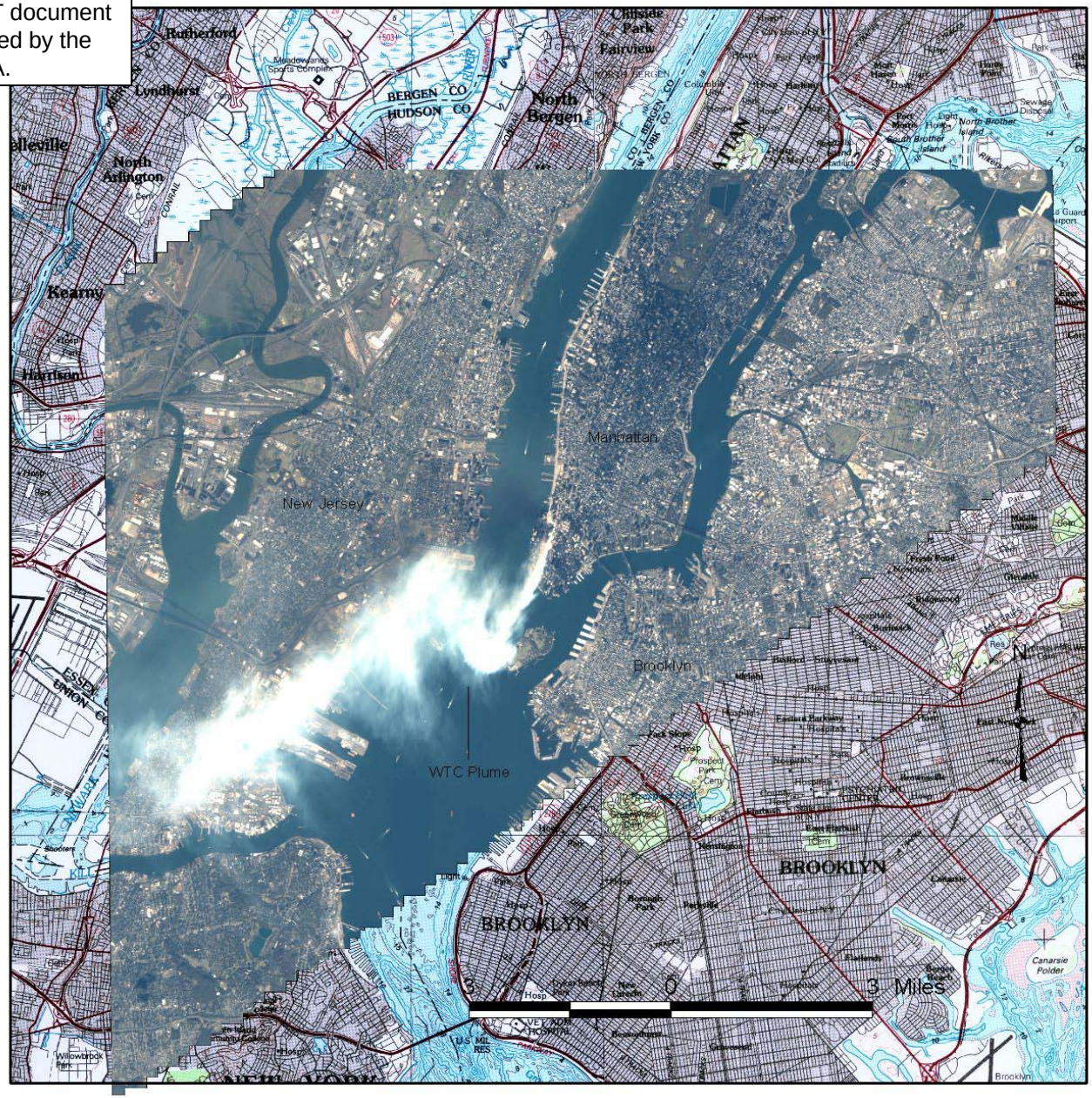

Figure 9. September 12, 2001. IKONOS one-meter imagery displayed in natural color bands 3,2 and 1. Study area coverage is approximately fifty percent.

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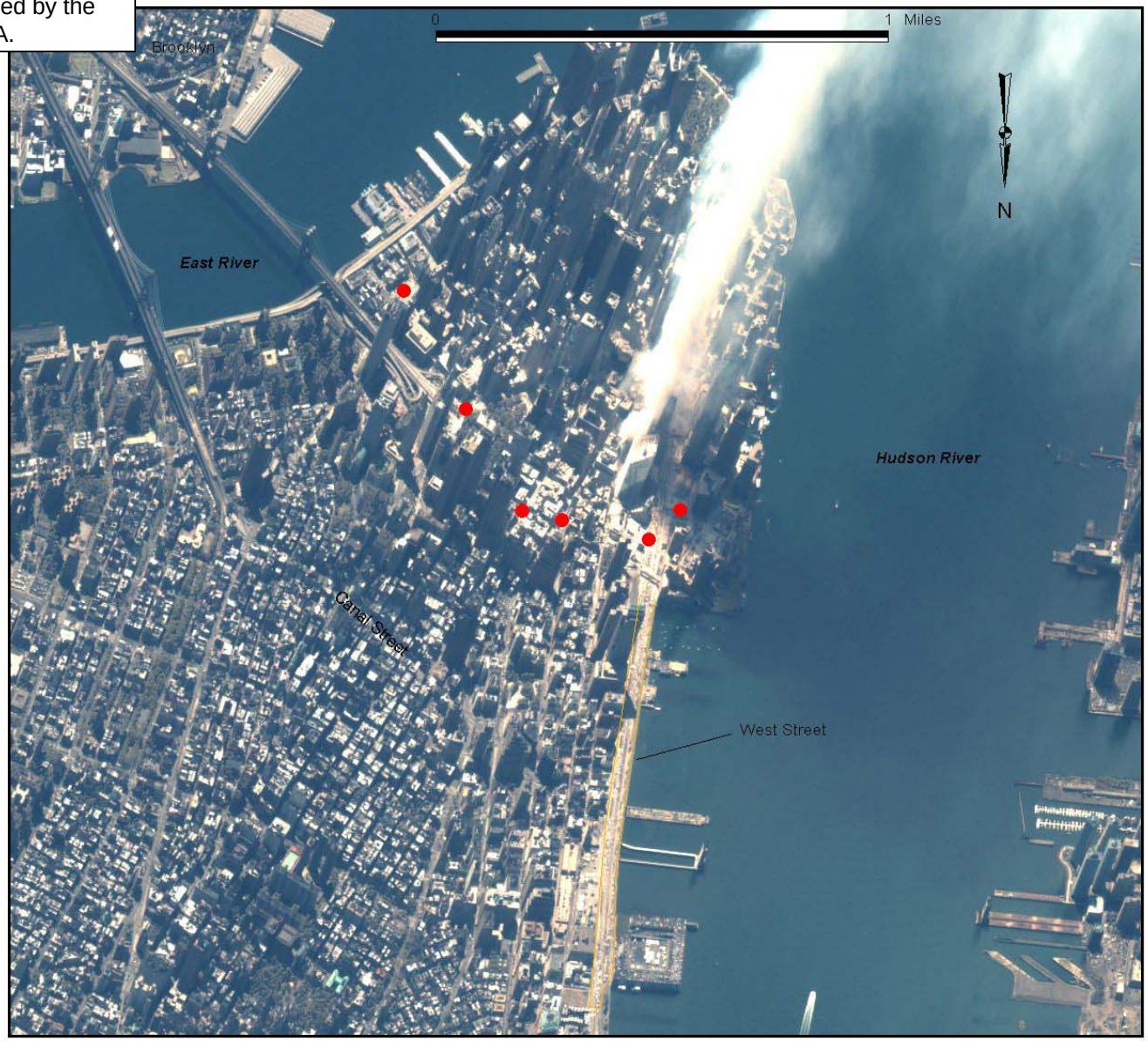

Figure 10. September 12, 2001. IKONOS-1 imagery displayed in natural color: bands 3, 2 and 1. Points in red represent areas of dust observed in lower Manhattan. Lines in orange, along West Street, represent probable dust due to vehicle dispersal.

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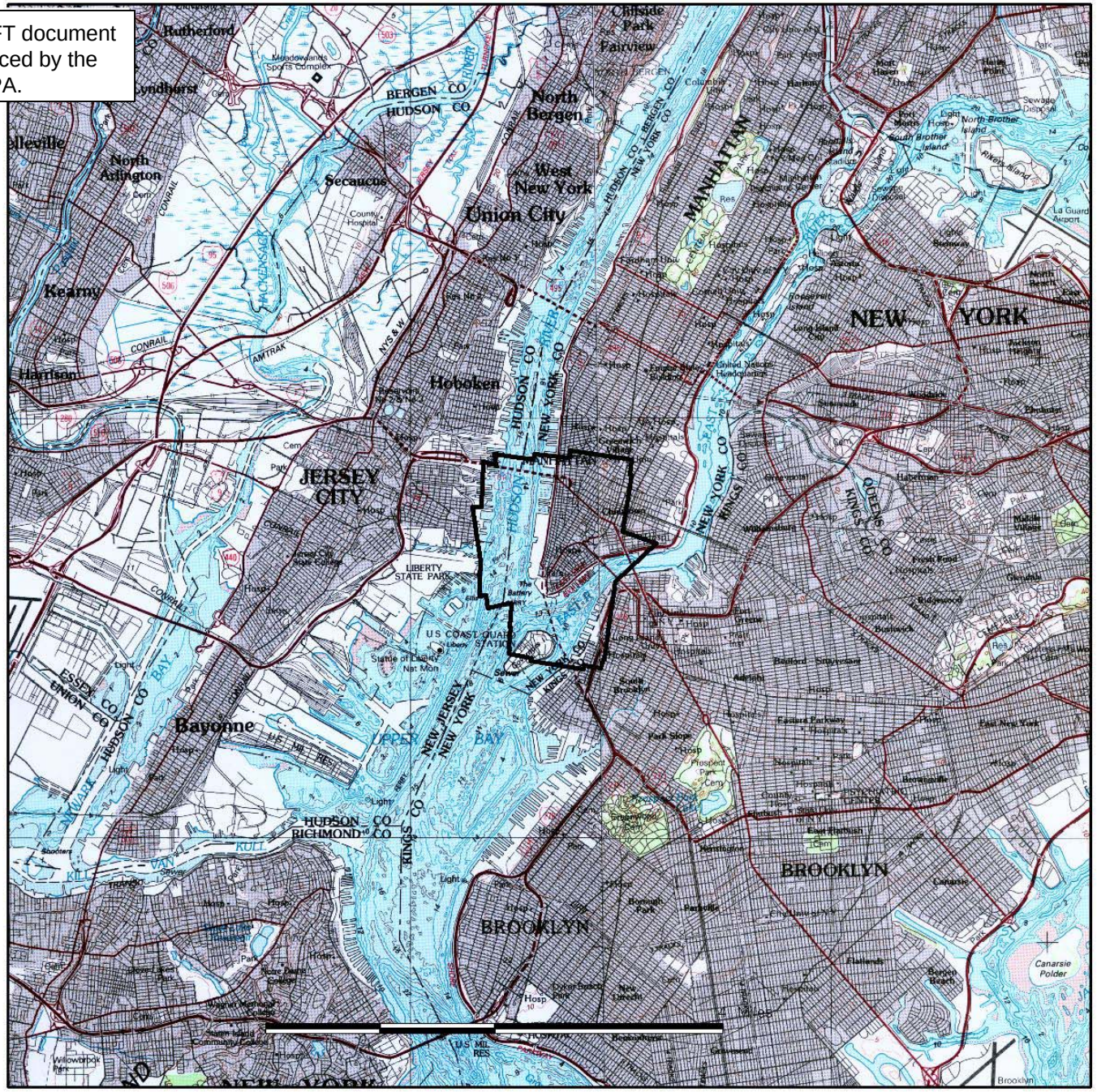

Figure 11. Area of coverage of September 13, 2001 aerial photographs (outline in black).

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Mapping Results from September 13, 2001 aerial photographs

- Confirmed Dust/Debris
- Probable Dust/Debris
- Possible Dust/Debris
- Vehicle tracks and possible dust
- Excavation Area
- Mounded Material

0 0.2 0.4 0.6 Miles

N

Figure 12. September 13, 2001. Image mosaic of lower Manhattan and portions of Brooklyn. Points in black represent areas where vehicle tracks and possible dust were observed along wharf areas in Brooklyn.

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Figure 13. September 13, 2001. Enlarged image providing an example of probable dust along Canal Street between West Broadway and the Avenue of the Americas.

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Figure 14. September 13, 2001. Enlargement of wharf area in Brooklyn along the East River in the vicinity of the intersection of Congress and Columbia Streets. Locations of vehicle track patterns, in dust, are noted as black points. The excavation area is mapped in brown.

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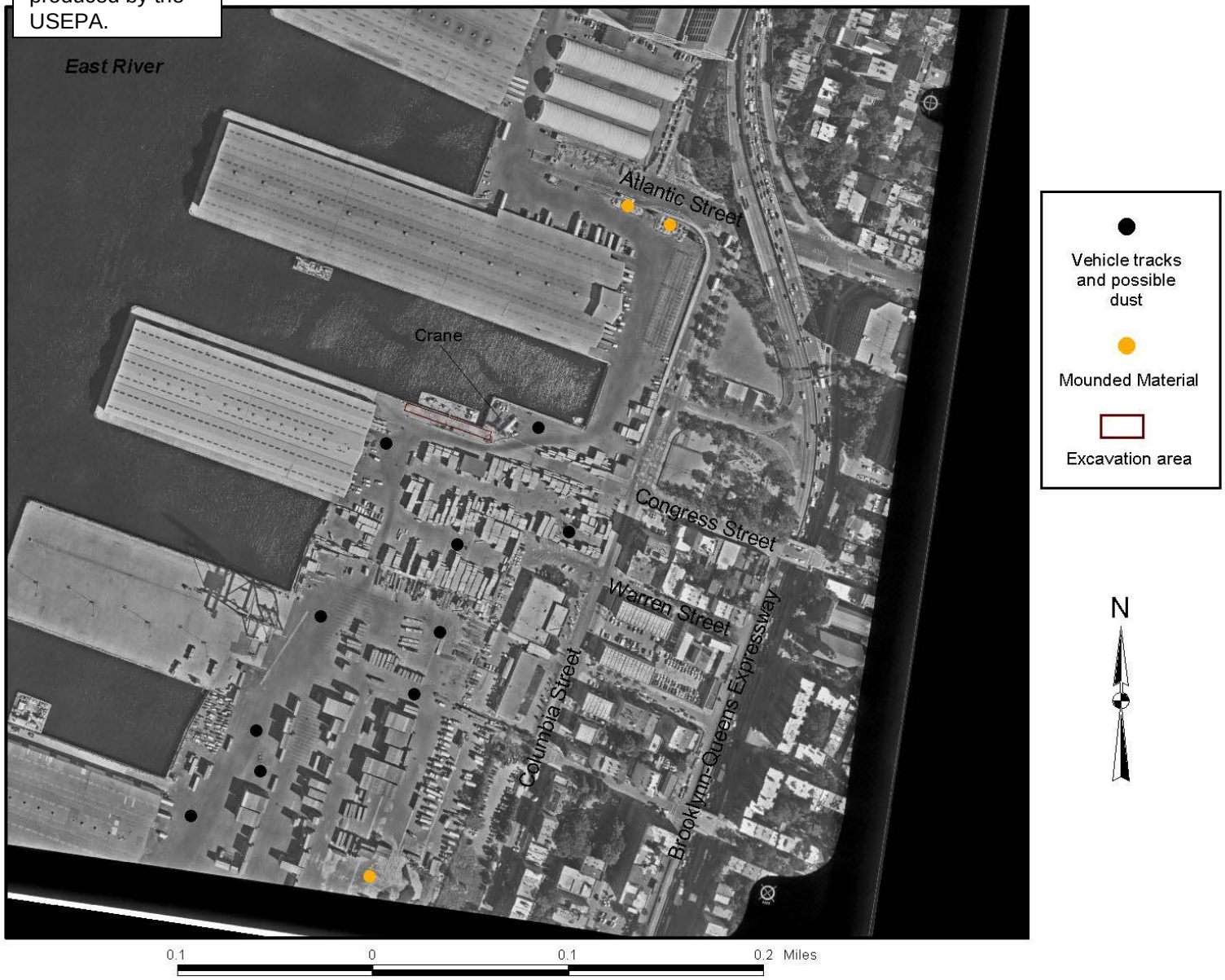

Figure 15. September 13, 2001. Enlargement of wharf area in Brooklyn along the East river in the vicinity of the intersection of Congress and Columbia Streets. Locations of vehicle track patterns, in dust, are noted as black points. The excavation area is Mapped in brown. Areas of mounded material are noted as yellow points.